023

temperature-compensated crystal oscillator

A Dallas Semiconductor application

The clock in computers and many other electronic systems is normally provided by a simple crystal oscillator. Unfortunately, the electromechanical properties of such a clock are normally such that it may vary as much as 100 minutes per year from real time. This is, of course, a highly unsatisfactory, and, to many people, inexplicable situation. After all, if a cheap watch can keep (reasonable) time, why can an expensive computer not?

Yet, the reason for this is fairly simple. Watches, even the cheap ones, are designed to work at body temperature, which is fairly constant Clocks in computers and other electronic appliances, however, are designed to work at room temperature, say, 20–25 °C. When the ambient temperature is higher or lower, as happens in rooms and offices which are not constantly heated or cooled as the case may be, the clock will drift.

Dallas Semiconductor has now introduced a temperature-compensated oscillator (TXCO), which is eminently suitable for use in computers and other appliances where correct time-keeping is important. The very small integrated oscillator enables a clock to be constructed that does not vary by more than ±1 minute per year (±2 ppm) over a temperature range of 0–40 °C.

The IC type-coded DS32kHz is an accurate and affordable

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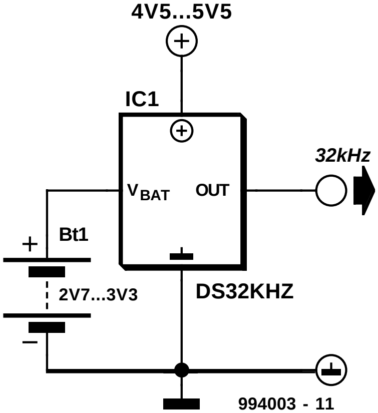

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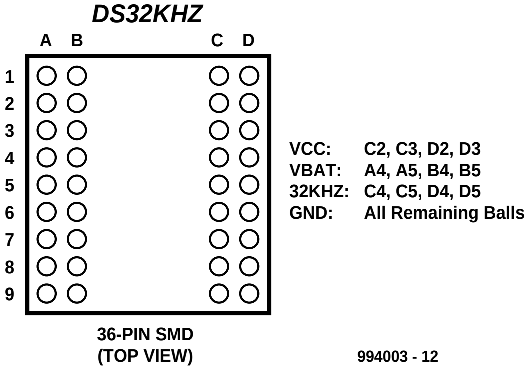

replacement for standard 32,768 kHz crystals and oscillators. Its output can drive virtually any RTC chip.

The SMD case of the DS32kHz contains a quartz crystal and a temperature-compensating circuit. In this circuit, use is made of a thermal sensing technology specially developed by Dallas. External components are not needed: the IC is calibrated at the factory.

The circuit in **Figure 1** shows that connecting the TXCO is straightforward. The backup battery connected to V_{BAT} ensures that when the mains voltage fails, the clock remains on. If a backup battery is not used, V_{CC} should be connected to GND and a supply voltage of 2.7–5.5 V to V_{BAT}.

The device is available only in SMD format. Its pins are arranged as a 36-pin ball grid array. The pinout is shown in **Figure 2**.

[994003]